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Note to COMIREX Secretaries:

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all changes have been made but Annex A is  
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PROJECT

# MARINE SCIENCES ANNEX

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Memorandum For: All Holders of "Marine Science Annex, [REDACTED]

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Subj: Required alteration and changes for the Marine Science Annex -  
Report [REDACTED] 1 May 1969, TCS 207,005/69

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Encl: (1) Special Handling Caveats (2)  
(2) Replacement page - Appendix - sheet 40 of 50  
(3) Corrected page - Illustration sheet 14 of 50

1. On the hard cover it is necessary to include the Special Handling caveat specified for all volumes of [REDACTED]. Each numbered copy of this report shall be altered to conform to the following requirements:

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Most respectfully,

Attention:  
TCO, Dir., Central Intelligence  
Agency

[REDACTED]  
GUSTAVE W. WOLF  
Scientific Staff Assistant  
U. S. Naval Oceanographic Office  
TCO

STATOTHR

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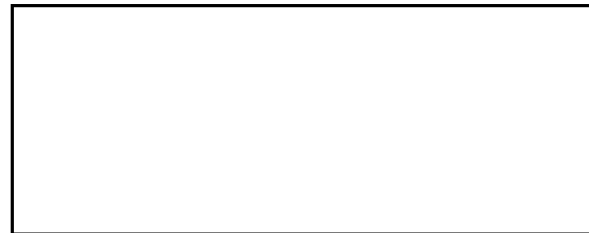
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APPENDICES

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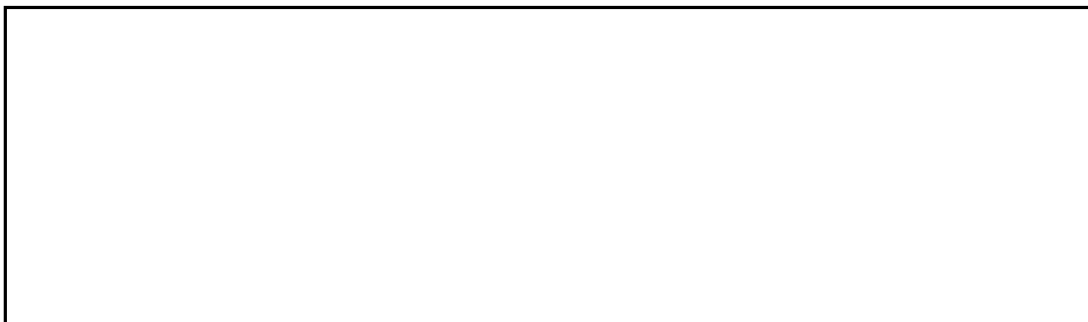
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*to report*

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# MARINE SCIENCES ANNEX

MAY 1, 1969

PREPARED BY  
THE ARGO MARINE SCIENCES WORKING GROUP  
WITH THE ASSISTANCE OF  
THE U. S. NAVAL OCEANOGRAPHIC OFFICE

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INTRODUCTION

25X1A In December 1968, the [ ] Steering Committee established a working group on marine sciences to review the conclusions presented in the May 1968 [ ] Report concerning marine sciences, identify specific agency requirements that could be completely or partially satisfied by [ ] material,<sup>1</sup> and suggest steps to facilitate utilization of this material. 25X1A The working group did not attempt to analyze the cost/effective aspects of obtaining and using [ ] material in relation to conventional means of satisfying agency requirements. However, the unique characteristics of the available systems for acquiring [ ] material were carefully considered in selecting the requirements which could most effectively be satisfied by these systems. 25X1A

25X1A This Report presents the conclusions of the working group. It does not represent requests for specific future missions to obtain [ ] material but is intended to provide the basis for such requests. Specific requests must be tailored to the capabilities and readiness of the concerned civilian agencies to utilize efficiently the material as it is obtained. 25X1A

Several agencies with significant interest in activities along the coast or in the high seas, including the Office of Emergency Preparedness, the Department of Housing and Urban Development, the Atomic Energy Commission, and the National Science Foundation, did not participate in this effort. However, it is believed that the views of these agencies would reinforce rather than contradict the general conclusions concerning the usefulness of [ ] 25X1A

<sup>1</sup>Photography and other sensor data acquired by reconnaissance satellites and high-flying reconnaissance aircraft.



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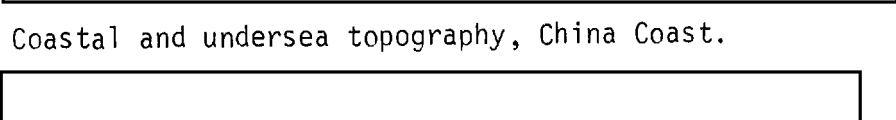
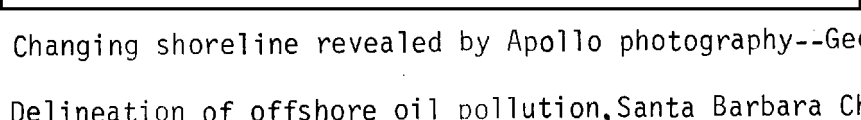

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I. SUMMARY AND CONCLUSIONS

25X1A [ ] material could assist significantly in meeting a number of agency requirements in the field of marine sciences. Even though the existing and planned systems are far from optimal in design and operation for meeting civilian requirements, examination of products of these systems clearly establishes the usefulness of [ ] material to a number of civilian planning, research, and operational needs. It is likely that a more deliberate orientation of some limited aspects of the systems to [ ] requirements<sup>1</sup> would provide materials far more useful than the past by-products of other missions.

25X1A [ ] material could contribute to civilian needs in a variety of areas including coastal zone management activities, control of ocean pollution, forecasts of ice conditions, port system analysis, understanding of ocean processes, and surveillance of fishing activity. Coverage of remote areas such as off the coast of Alaska would be particularly valuable in providing information that is not presently obtainable by any other means. Also, coverage of very large coastal and ocean areas can be valuable in identifying areas for detailed investigations by conventional means. Specific agency requirements are summarized on page 3.

Several civilian agencies share interests in development of coastal areas, conditions in the Arctic and the Great Lakes, and activities on the high seas. These overlapping interests reflect national, as well as agency, needs to promote productive and wise use of coastal areas, respond to natural and other disasters along our shorelines, and increase our understanding of ocean phenomena. Hence, certain types of [ ] material of interest to several agencies, together with products derived from this material that might be made available publicly by proper sanitization and declassification, would be useful to a broad national constituency.

25X1A Applications of [ ] material in the field of marine sciences generally fall into three categories: planning, research, and operations. They may be further categorized according to the perishability of the material, repetitiveness of coverage needed, and flexibility in the timing and geographical location of the coverage. The procedures for requesting specific missions and for distributing material will thus vary with the

<sup>1</sup>Requirements for civilian use that might be fulfilled by the collection system referred to in this Report.

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specific requirement. In any event, the [ ] Steering Committee should serve as the focal point for requests from civilian agencies for coverage by reconnaissance satellite and aircraft systems in support of [ ] requirements.

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[ ] material for several of the high priority requirements probably could be handled by present staff and funds in the concerned agencies, with the Geological Survey facility in Reston providing the necessary working space. However, a significant increase in use of [ ] material would require additional cleared personnel and funding and space arrangements.

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Many of the requirements identified envisage handling of [ ] material only by Government and contractor personnel thus easing security problems. However, some of the requirements include public dissemination of [ ] products. In a number of instances relaxation of security restrictions could greatly enhance the usefulness of [ ] imagery and [ ] products. Of particular importance are sanitization procedures. It would be very helpful if steps were taken to increase the participation of civilian agencies in sanitization procedures involving [ ] materials and applications of interest to those agencies. Increased use of color film and frequency of coverage would also increase the value of the material to the oceanographic community.

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## II - EXPERIENCE TO DATE

Reconnaissance satellite and aircraft systems designed to obtain military intelligence have during the past several years shown that high resolution photographs are potentially of great value in aiding civilian agencies in accomplishing their diverse missions in the field of marine sciences. The availability of photographs with resolution of ten feet over large areas and as high as three feet in selected smaller areas has already contributed to:

- delineation of coastlines and coastal topography for correction of nautical charts
- sea ice studies to accelerate development of forecasting models and operational ship routing techniques
- analysis of patterns and movement of massive oil spills
- definition of port and harbor developments, including coastal engineering structures, and
- studies of coastal sedimentation and erosion to aid land-use planning in the coastal zone.

25X1A Project [ ] a nine month study initiated in July 1967 to identify broad "peaceful areas" of utilization of classified reconnaissance photography by Federal civilian agencies--identified numerous ways in which satellite photography might foster marine science research, development, and operations. Use of the photographs within the Department of Defense for mapping, charting, and geodesy and sea ice studies commenced prior to Project [ ]. Other applications including monitoring major pollution incidents such as the Santa Barbara oil spill and studies of coastal and estuarine sedimentation and erosion have been initiated only recently.

25X1A The application of [ ] material to topographic mapping by the Geological Survey has also demonstrated the usefulness of such material in delineating coastal features. Concurrently with the increasing use of [ ] material a number of unclassified studies as well as unclassified GEMINI, APOLLO, and aircraft experiments have highlighted the broad range of potential applications of high resolution satellite photography in the field of marine sciences, and particularly the value of broad synoptic coverage.

25X1A The following figures summarize some of the areas where there has been direct experience in analyzing high resolution satellite photography relevant to the requirements of civilian agencies.



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## MARINE SCIENCES ANNEX

Appendix A consisting of pages numbered 41, 42, and 43 have been detached from this report and are filed separately.

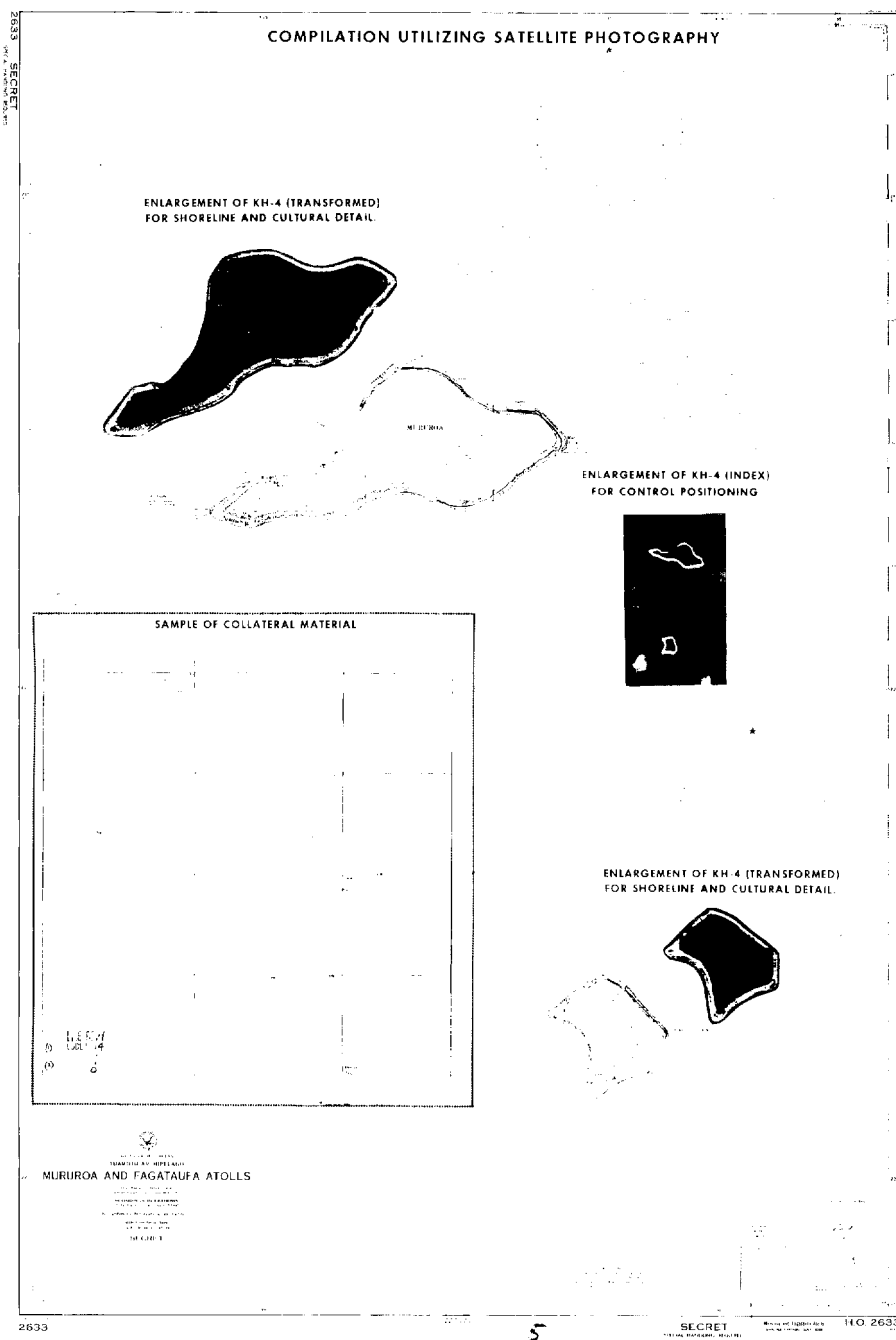


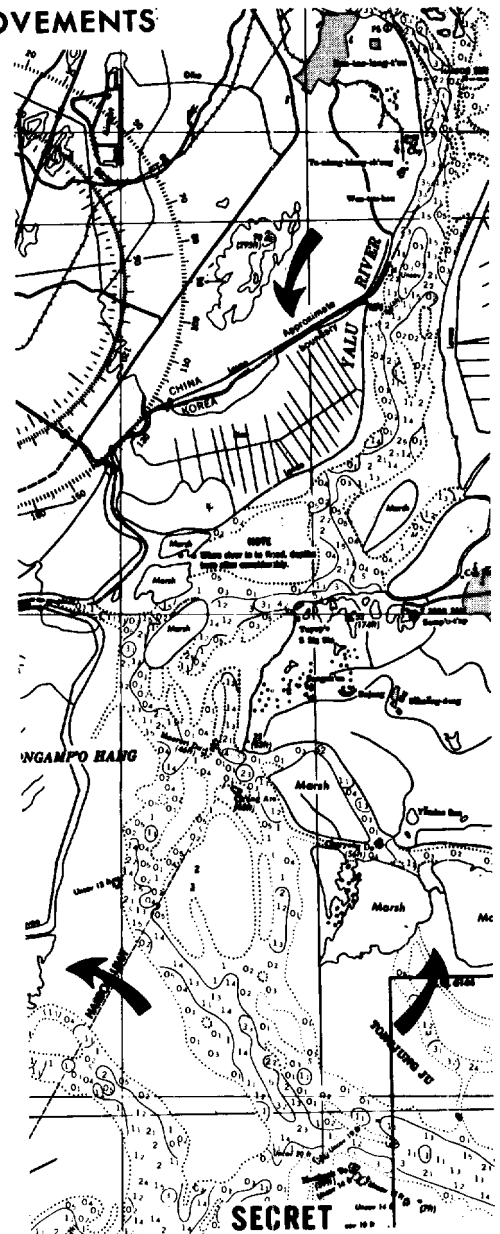
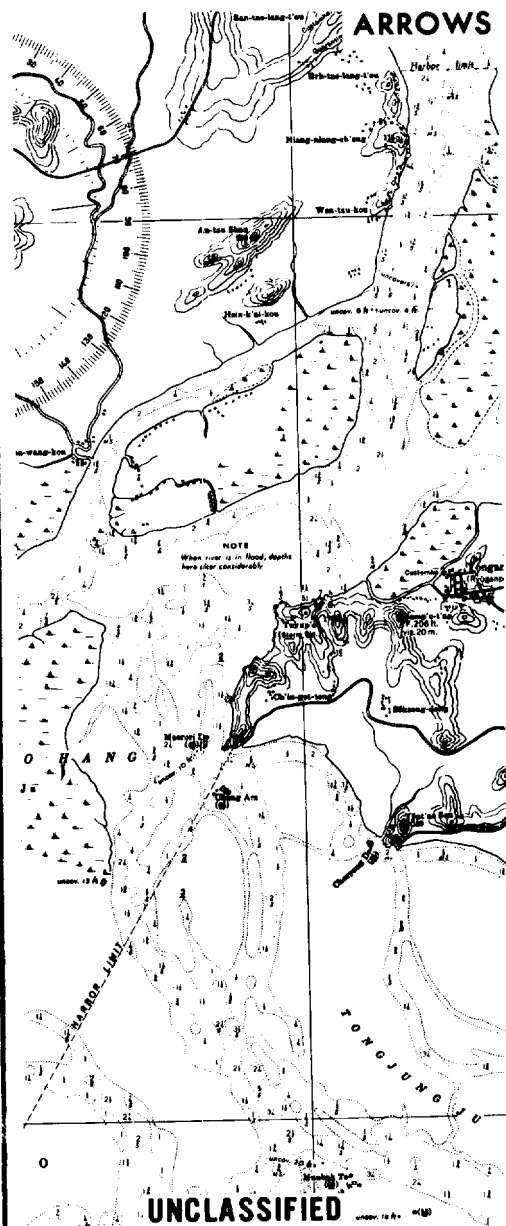
Figure 1. Photographs of Mururoa and Fagataufa atolls in the Tuamotu Archipelago obtained with the KH-4 panoramic camera in August 1966 enabled cartographers to develop a highly accurate portrayal of the islands and upgrade the quality of nautical charts of this area. Charts of the Tuamotu Archipelago previously were derived from 1936, French charts scaled at about 1:400,000. A new and more accurate chart of the area has been published at a scale of 1:75,000--useful for precise navigation. Thus, such photographs can facilitate the delineation of coastlines and the correction and edition of new nautical charts. Frequently such photographs are the only means to obtain information for this purpose.

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# **REVISING COASTAL FEATURES ON NAUTICAL CHARTS**

**ARROWS DENOTE AREAS OF MAJOR IMPROVEMENTS**



**PORTION OF HO-2502  
YALU RIVER DELTA**

Figure 2. Specific changes made in one portion of a 1945 Yalu River chart are shown with a portion of one of the original KH-4 photographs on which the changes were based. New harbor approaches, channels, and land boundaries clearly delineate major changes in physical geography and land use. Sediment transport along portions of the China coast rapidly transforms the shape of coastal features and contributes to the obsolescence of navigational charts. The KH-4  provided photographs, frequently obtainable in no other way, that facilitate nautical chart revisions of coastal topography affecting navigation.

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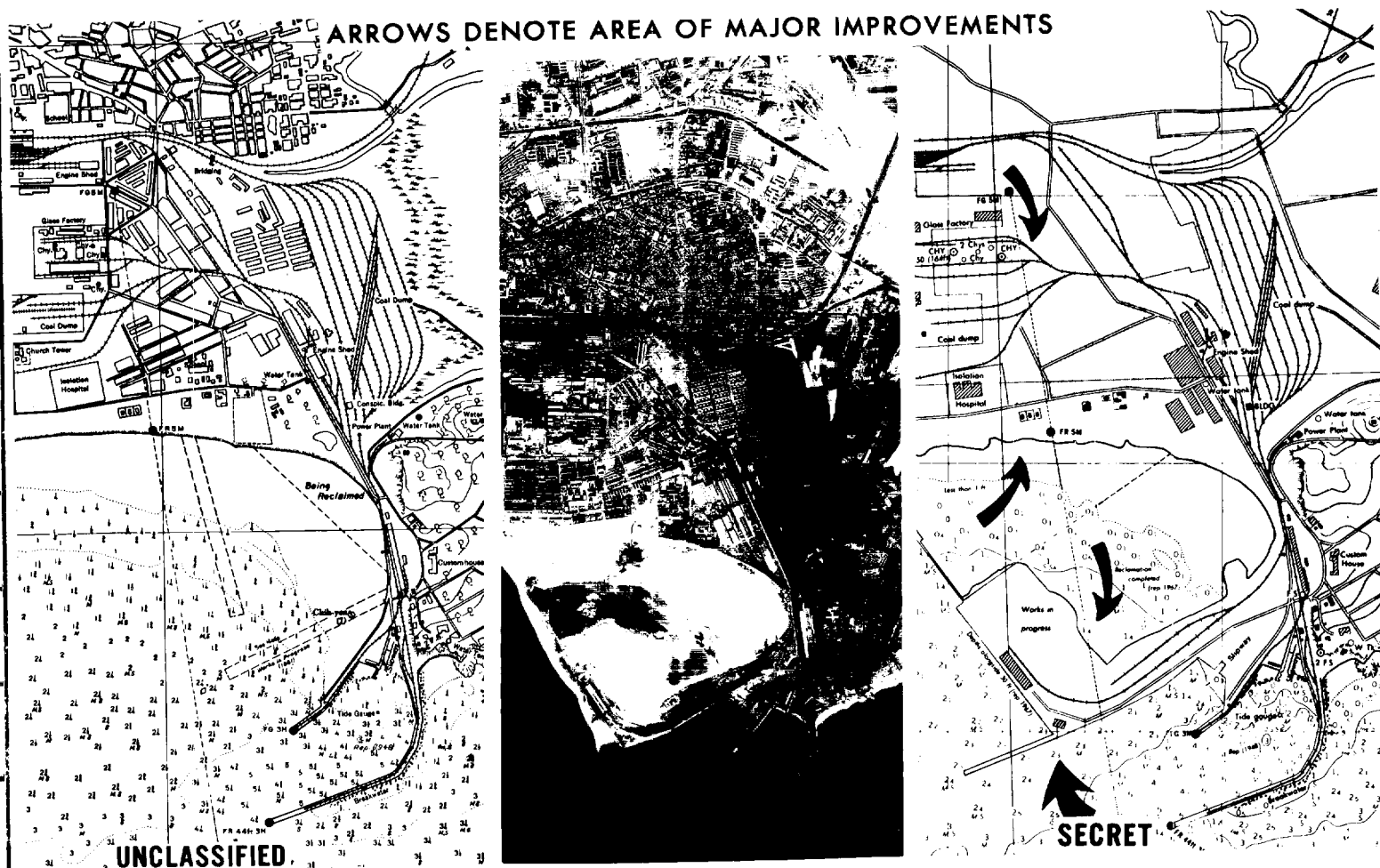
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# REVISING CHART DETAILS OF PORT AND HARBOR DEVELOPMENT

ARROWS DENOTE AREA OF MAJOR IMPROVEMENTS



PORTION OF HO-2512  
CH'IN-HUANG-TAO ANCHORAGE

Figure 4. Extensive changes in the Chinese Harbor of Chin-Huang-Tao, revealed by a KH-4 photograph, are shown incorporated in one portion of the revised edition of the nautical chart for this port. An inset from an older chart is shown at the left; the center inset is the original photograph; and major port improvements in the revised 1968 chart are depicted at right. New coastal engineering projects and changes in port and harbor configurations and facilities relevant to transportation system analysis and planning can be readily identified in such photographs. The cartographic quality of the photographs facilitates corrections of this kind and suggests broader application of these techniques to update regularly world-wide port and harbor charts.

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# MOSAIC OF PANORAMIC PHOTOGRAPHY OF ARCTIC SEA ICE NEAR SEVERNAYA ZEMLYA

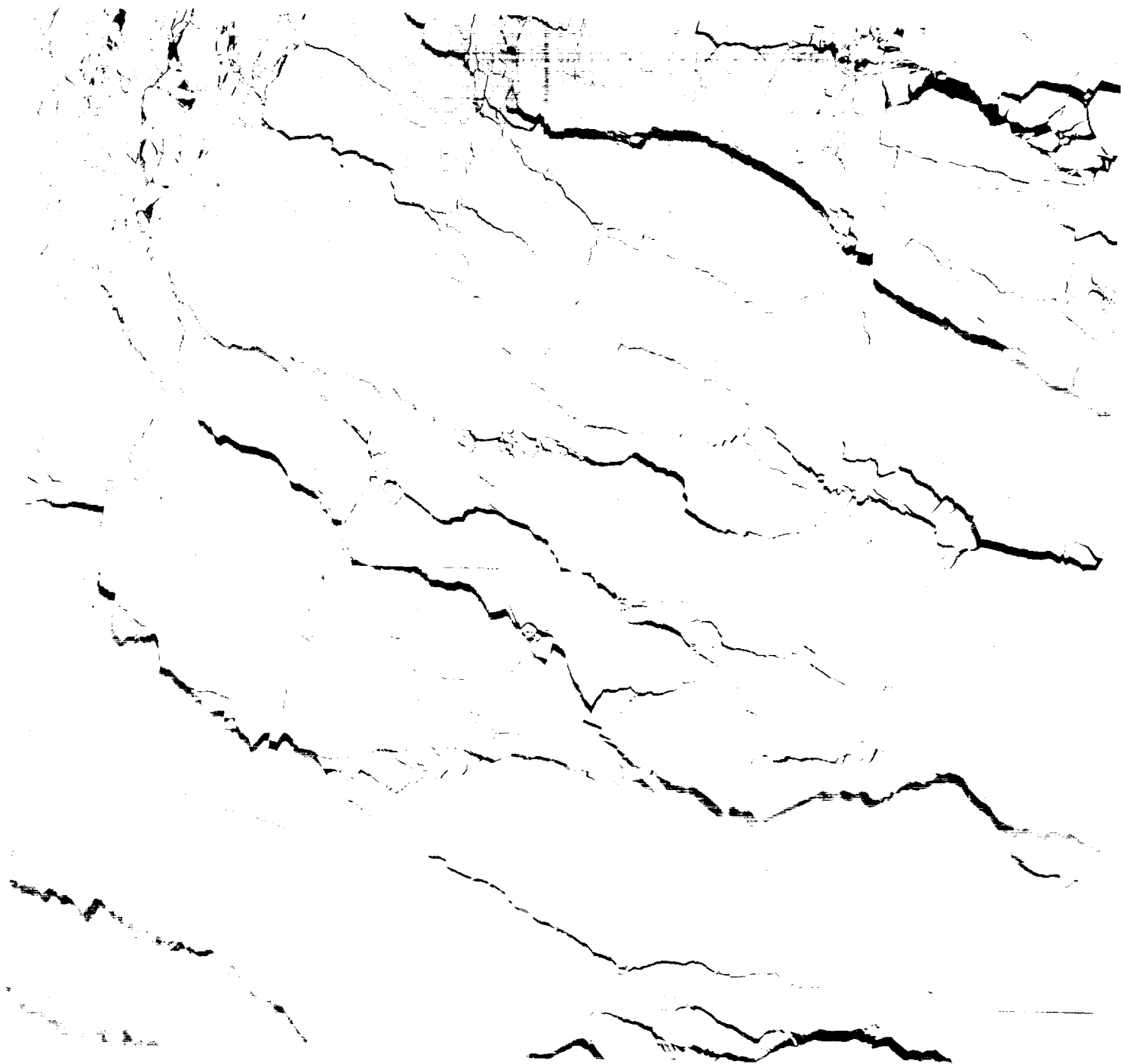


Figure 7. A mosaic of KH-4 strip photographs of Arctic sea ice near Severnaya Zemlya taken [redacted] shows ice pack openings of possible use for surface navigation. Photographs such as these can contribute greatly to improving ice forecasting and ship routing and to enhanced safety of polar operations.

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## ICE CHART FOR ARCTIC NAVIGATION

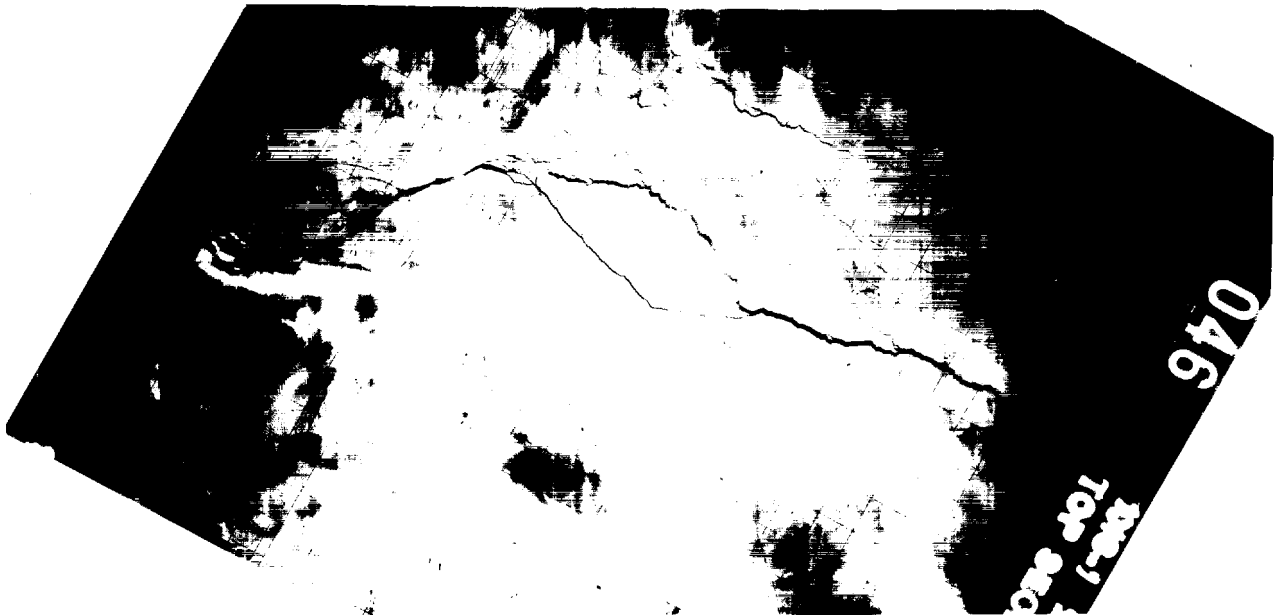
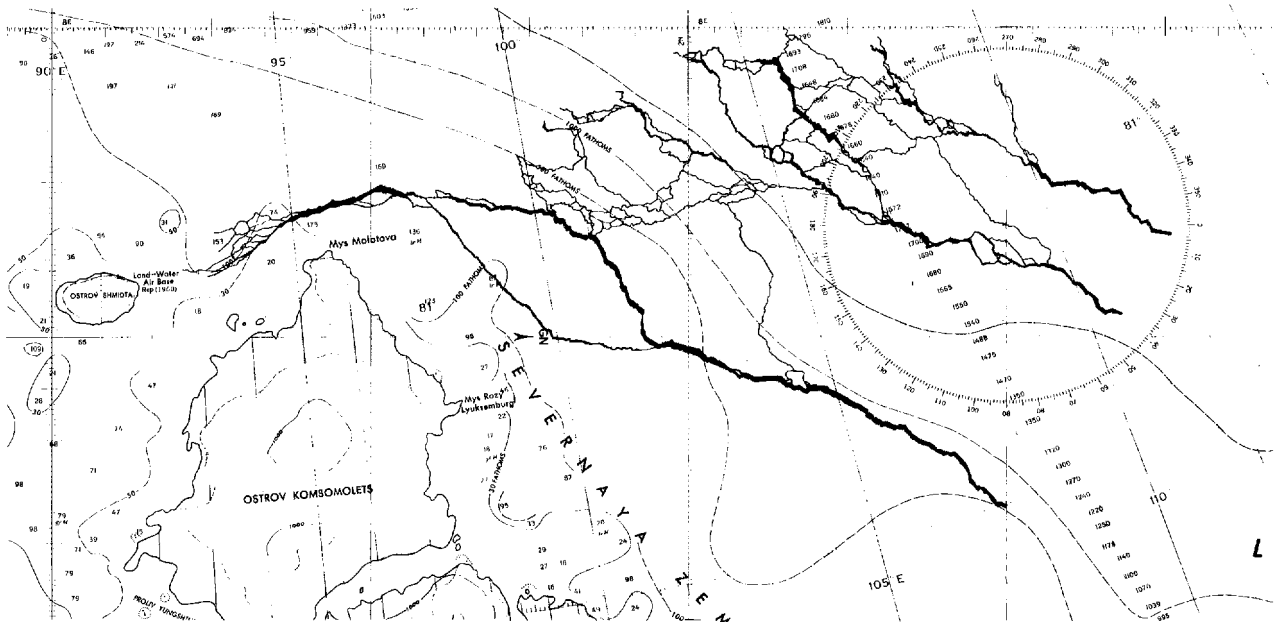


Figure 8. A special purpose ice navigation chart is shown along with its associated photography: a mosaic of KH-4 photographs of the polar ice pack taken [ ] off Severnaya Zemlya. Such ice charts can be used for surface or subsurface navigation for short periods--one to two weeks. Pressure changes alter openings within the pack following prolonged changes in surface winds or currents. The charts are also useful in research related to defining the statistical nature of polar ice and the spectral distribution of openings of various sizes essential to Arctic operations. Such photography can increase data availability for these purposes by more than a factor of ten and thus greatly accelerate investigations relevant to Arctic resource development, transportation, and the behavior, geographical distribution, and engineering characteristics of polar ice masses.

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## LARGE SCALE STUDY

### SEA ICE DYNAMICS IN THE BERING STRAITS

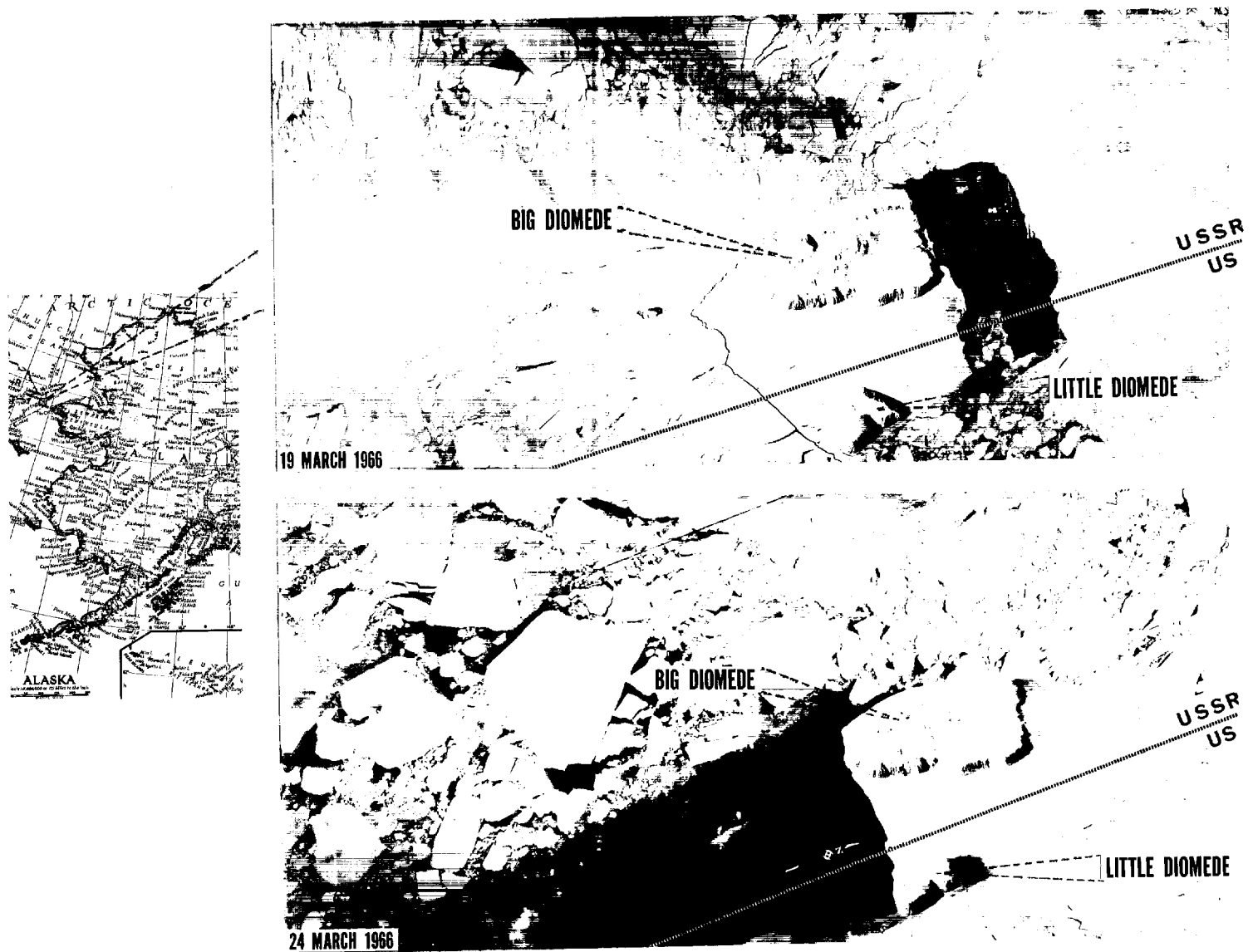


Figure 9. KH-4 photography shows radical changes in ice distribution occurring within a five day period. Of particular interest is the change in configuration and location of open water areas, evident first on the northern side of Big Diomedes

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# COASTAL AND UNDERSEA TOPOGRAPHY, CHINA COAST

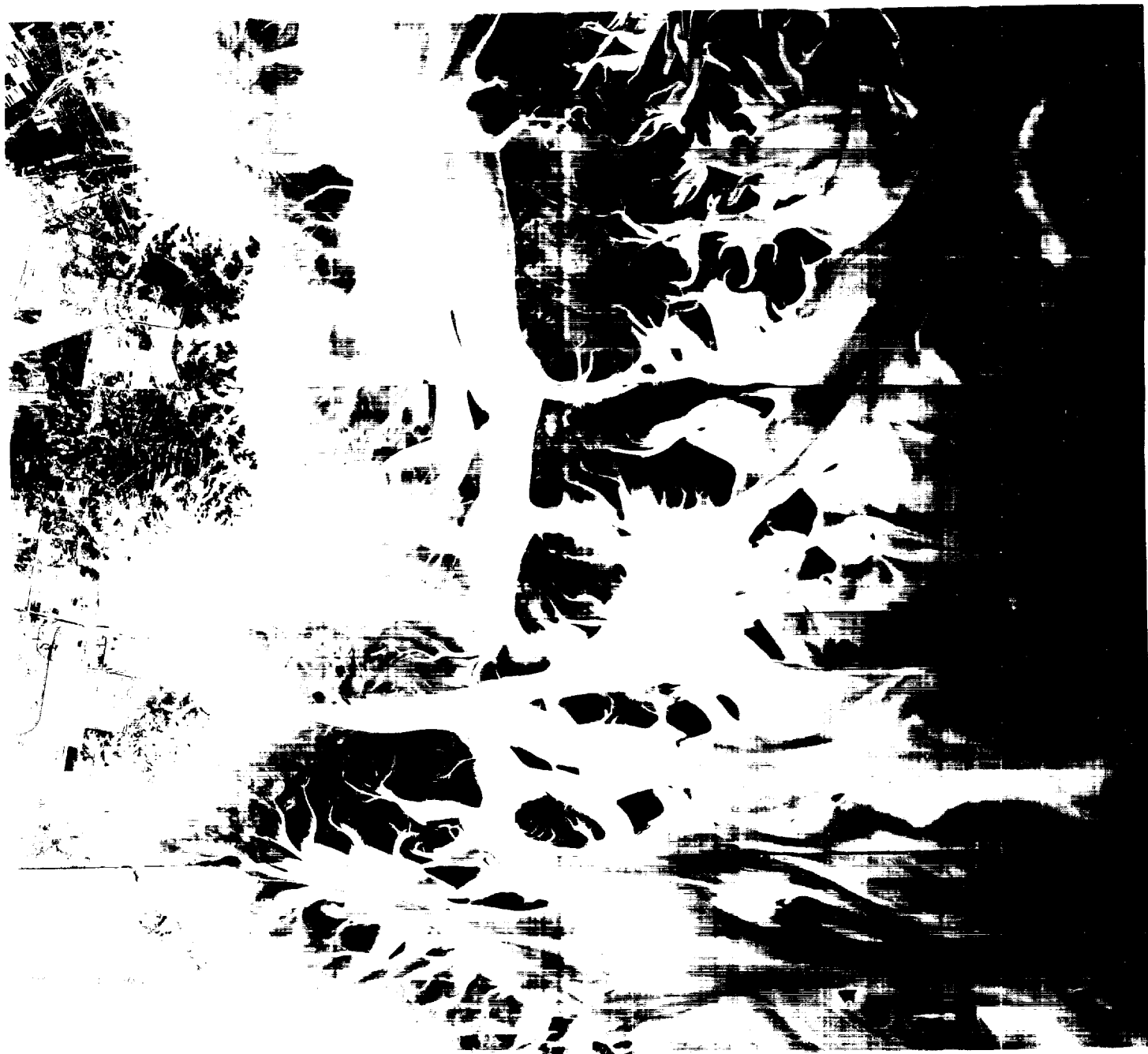


Figure 12. A selected portion of a KH-4 photographic mosaic shows a dendritic pattern of undersea channels off the central coast of Mainland China, illustrating the potential value of such photographs for studies of coastal processes of sedimentation and erosion, longshore sediment transport, formation of undersea canyons, and turbidity current processes of sediment transport and deposition in deeper water. While such photographs may not be of optimum quality for studying undersea features--filtered color photography would be preferable--they provide substantial information which can aid in analysis and understanding of coastal changes essential for ocean engineering, conservation, and resource management activities.

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# CHANGING SHORELINE REVEALED BY APOLLO PHOTOGRAPHY GEORGIA COAST

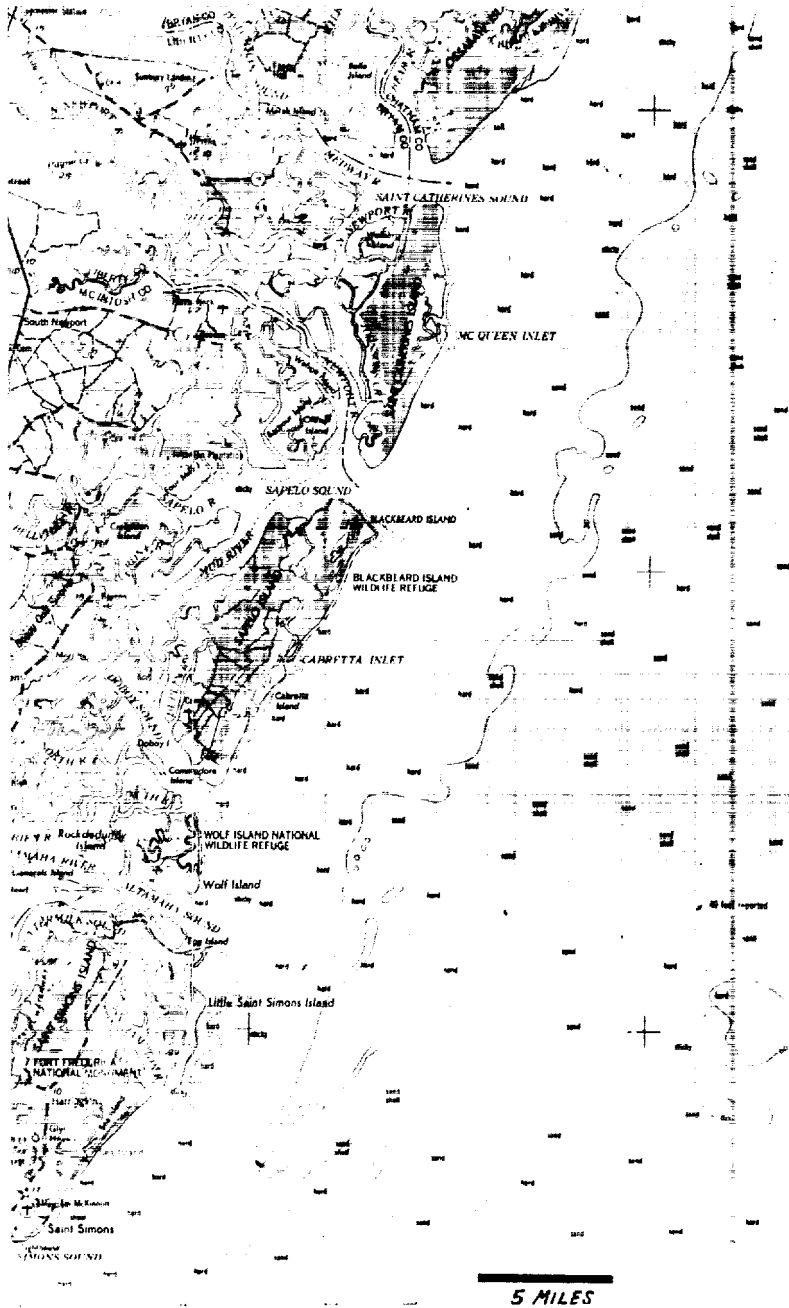


Figure 14. A recent Apollo photograph of a part of the Georgia coastline indicates shoreline changes since the map for the area was revised in 1956 and also provides some indication of underwater features. Unclassified photography such as obtained from Apollo, Gemini, and aircraft missions not only can provide complementary information to [ ] material but might provide plausible cover for release of certain types of [ ] products.

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## DELINEATION OF OFFSHORE OIL POLLUTION, SANTA BARBARA CHANNEL

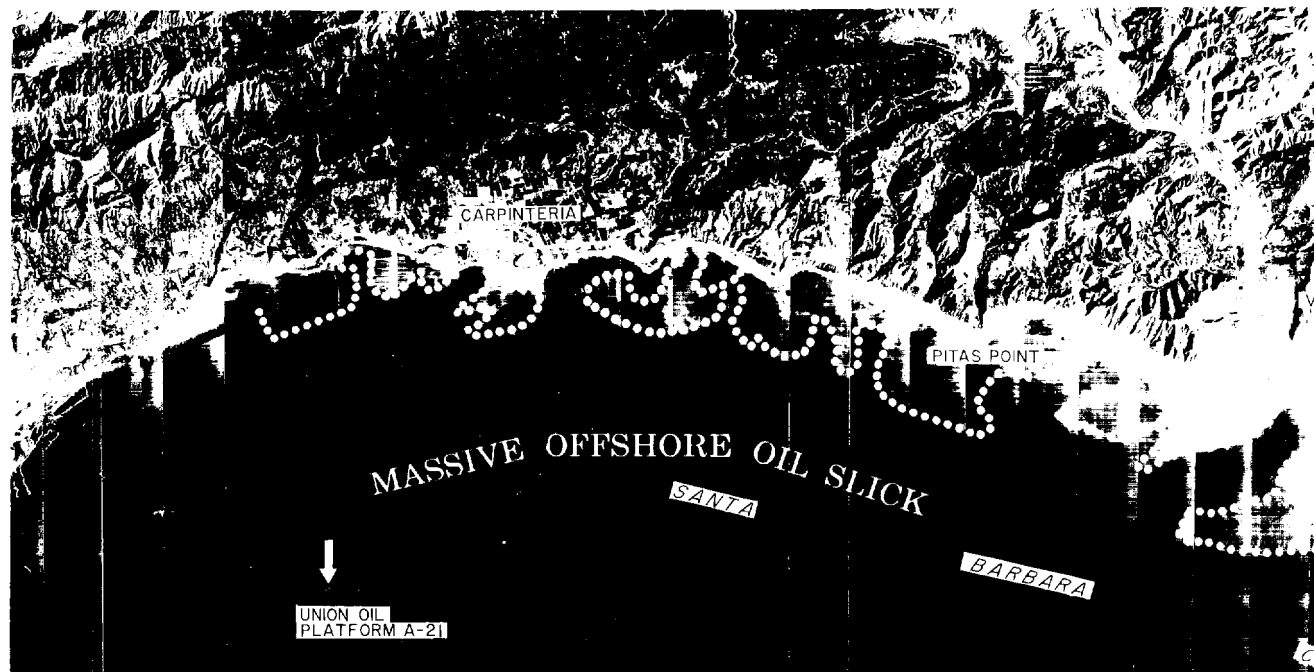


Figure 15. A mosaic of panoramic photographs obtained by a U-2 aided in assessing the extent of a massive oil slick following a gas blowout at an oil well in the Santa Barbara channel. The contrast between oil-covered water offshore in the channel and runoff from the adjacent land is shown. Such photographs aid in planning restoration measures and in deploying "clean-up" forces throughout the area. In addition, such photography can provide additional insight for research on new techniques for mitigating the effects of future pollution accidents. Also, detectable near the platform itself are a number of vessels, suggesting use of reconnaissance photography for broad-scale reconnaissance of selected ocean areas.

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# WATER DEPTH AND POLLUTION ANALYSIS FROM COLOR PHOTOGRAPHY MALMO, SWEDEN

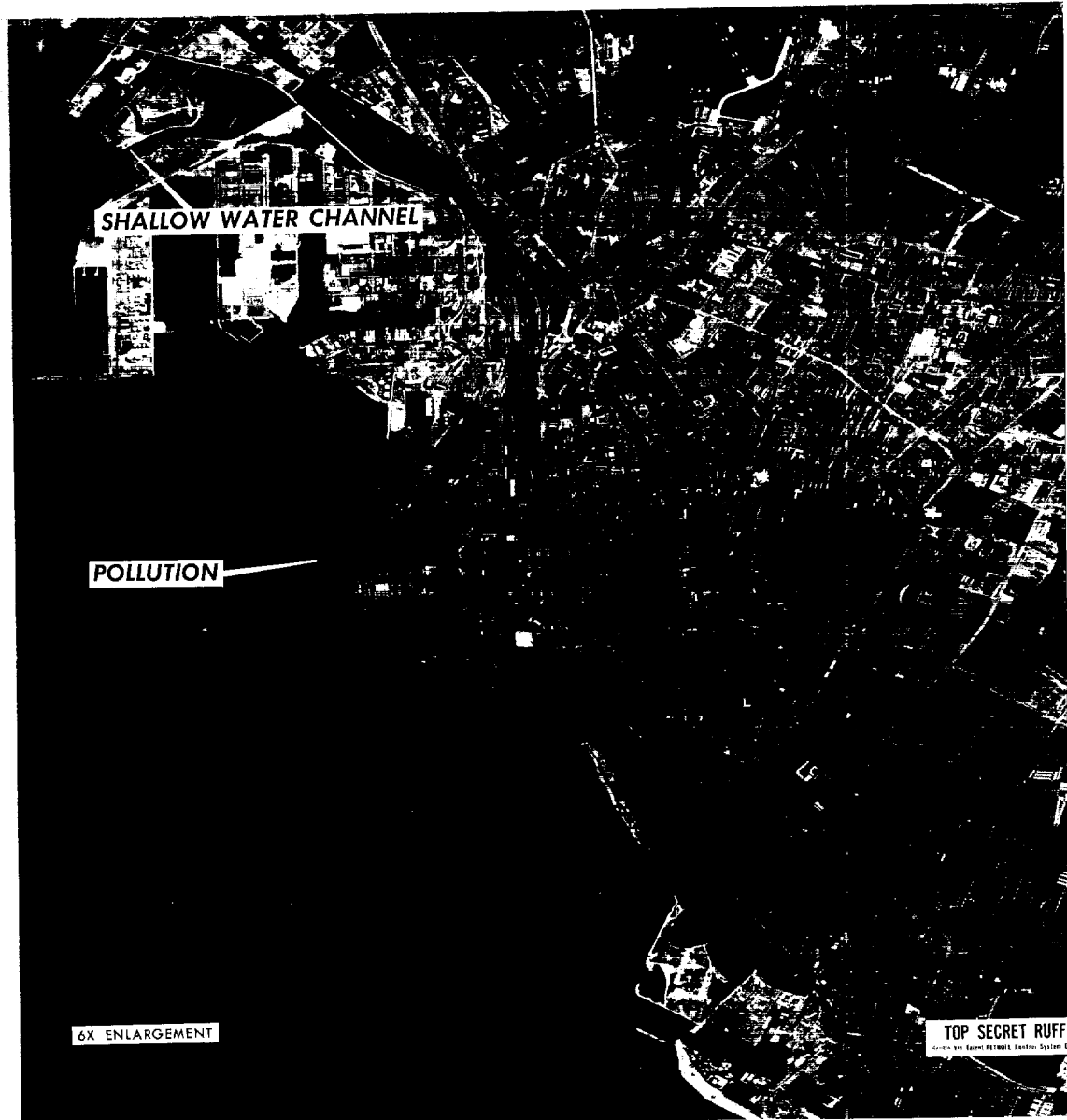
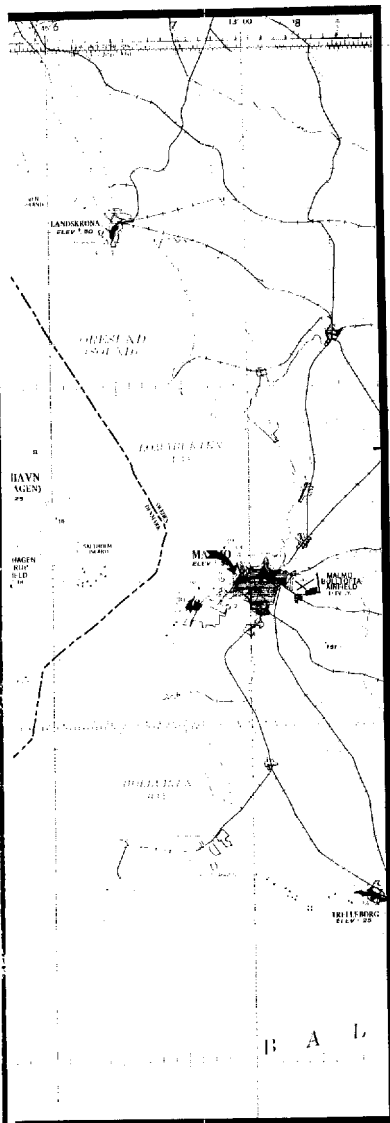


Figure 17. This KH-4 photograph of Malmo, Sweden, shows potential application to water depth and pollution analysis. Such photography can assist in determining the total surface runoff. It is useful in correlating the intensity of annual precipitation and the rate of transportation of industrial and city waste discharging into natural waterways and harbors. Thus, it will aid in predicting the rate of silting in coastal areas and shipping channels.

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III. DEPARTMENT OF COMMERCE APPLICATIONS

Agencies of the Department of Commerce, including the Maritime Administration and the Environmental Science Services Administration (the Weather Bureau, Coast and Geodetic Survey, National Environmental Satellite Center, and ESSA Research Laboratories) are broadly responsible for integrated maritime and environmental services. The Maritime Administration is concerned with development and improvement of marine transportation and port systems. Programs of the Weather Bureau are directed toward improving environmental forecasts, partly through better understanding of air/sea interaction processes. The Coast and Geodetic Survey has responsibility for updating nautical charts of the United States and its Territories to show hazards to shipping, including effects of major storms and tsunamis, and for improving tsunami prediction capabilities. The Research Laboratories are engaged in a broad range of oceanographic research activities, particularly in the field of physical oceanography.

1. Tsunamis:<sup>1</sup> Photographic reconnaissance data are unavailable for use in improving tsunami prediction techniques and for identifying tsunami damage that would aid in planning needed re-surveys of the coastal areas affected. High-altitude photographs would aid in assessing the extent of tsunami damage involving destruction and flooding, planning subsequent field operations required for updating nautical charts, and identifying seismic fault lines in selected coastal areas rimming the Pacific basin.

Product type: Black and white photographs.

Scale<sup>2</sup>/Resolution: (a) 1:300,000; (b) 1:40,000

System: (a) KH-4 panoramic

25X1D

Geographical Area: (a) Selected areas of the coastline of the Pacific Basin, particularly the coast of Mainland China, for fault delineation; (b) Hawaii, Alaska, and the west coast of the United States, as required for damage verification.

Frequency: After major events for damage verification; one-time coverage for the detection of fault lines in selected areas.

Priority: Damage assessment, high; seismic fault line detection, medium.

<sup>1</sup>Seismic sea waves.

<sup>2</sup>Scale refers to the scale of photographs--not end products --in this section.

2. Marine Environmental Prediction: Operational methods for verifying marine environmental forecasts of sea and swell conditions, sea ice, and marine weather generally over broad ocean areas are not available. Also, detailed observations of the structure of cloud systems over the ocean are unavailable to contribute to improved weather forecasting models. Photographs from which sea surface roughness can be determined over large ocean areas would aid research in improving methods for predicting ocean wave heights. Verification of the operational products obtained from present forecasting models and methods is a priority goal. The systematic analysis of sea ice photographs would aid understanding of the freezeup, breakup, and location and movement of floating ice masses, particularly as they affect local weather. Photographs of the detailed structure of cloud systems over ocean areas can facilitate the development of marine weather prediction models and aid in analysis of sea surface temperature and ocean current characteristics.

25X1D

Product type: Black and white and color photographs [redacted] imagery of sea state and cloud structure. Black and white photographs of sea ice.

25X1D

Resolution/Scale: (a) 1:40,000 for sea state observations;  
(b) 1:300,000 for sea ice, cloud structure, and thermal measurements.

System: [redacted] (b) KH-4 panoramic; SR-71.

Geographical Area: Selected areas of the North Atlantic and Pacific Oceans for sea state, cloud structure, and thermal data; Great Lakes for ice data.

Frequency: Twice per year or more frequently for sea state, cloud structure, and thermal data; approximately five observations per winter season for sea ice data.

Priority: Sea state and ice observations, high priority; cloud structure and thermal data, medium priority.

3. Coastal Surveys: Environmental data are frequently inadequate for planning nautical charting surveys and airborne photography to detect changes in coastal features. Satellite reconnaissance photographs would enhance planning of hydrographic surveys and conventional photogrammetry missions in coastal areas and economize on the use of limited resources. The data would contribute effectively to the detection of shoreline changes, new man-made features, new channels, and the closing of channels through coastal processes.

Product type: Black and white photographs.

Scale/Resolution: 1:300,000

System: KH-4 panoramic

Geographical Area: Entire U. S. coastline, including Puerto Rico and Virgin Islands.

Frequency: Annually.

Priority: High.

4. Aerotriangulation: There is growing economic interest in many areas of the Aleutian Islands, the Alaskan Peninsula, and the northern coast of Alaska, which are not adequately mapped. Reconnaissance photography could facilitate the coastal topographic and shoreline mapping of these remote areas and thus contribute to improving the quality of nautical charts for these regions.

Product type: Black and white photographs.

Scale/Resolution: 1:1,000,000

Geographical Area: Selected areas of the Alaskan Coast and Aleutian Islands.

Frequency: One time.

Priority: High

5. Detection of Marine Pollution: Broad surveys of thermal and particulate pollution of major U. S. estuaries are not available for policy planning and for development and implementation of appropriate pollution control measures. Synoptic photographs of estuaries, major harbors, and adjacent coastal areas would aid in improving mathematical models and related methods for predicting the dispersal of pollutants by flushing of estuaries, tidal and longshore currents, and other phenomena. The data would also provide an inventory of pollution and establish base lines for estuarine flushing forecasts.

Product type: Color and

25X1D

Scale/Resolution: 1:40,000

System: SR-71

Geographical Area: 12 major U. S. estuaries.

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Frequency: Bi-monthly and after major pollution incidents.

Priority: Medium.

6. Storm Damage: Following storm damage and shoreline changes sufficient data are generally unavailable to facilitate Federal planning, including establishing priorities for hydrographic and related surveys to correct outstanding nautical charts for the area. Photographic coverage following major hurricane or storm surge damage can provide a base line for planning nautical charting surveys in areas of greatest damage.

Product type: Black and white and color photographs.

Scale/Resolution: 1:40,000

System:  SR-71

Geographical Area: Damaged areas of east and Gulf coasts of the United States.

Frequency: Following major storm damage.

Priority: High.

7. Ports and Harbors: Survey data for ports and harbors are inadequate for base-line studies and management planning. Photographic coverage of the Nation's major harbors and adjacent areas would aid in government policy planning studies, transportation system analysis, land acquisition plans, and related activities.

Product type: Black and white photographs.

Scale/Resolution: 1:40,000

System:  SR-71

Geographical Area: 15 major U. S. harbors.

Frequency: Two to five year intervals.

Priority: Low.

IV. DEPARTMENT OF THE INTERIOR APPLICATIONS

The Department of the Interior is the principal resource agency, with marine programs of the Geological Survey, Federal Water Pollution Control Administration, Bureau of Commercial Fisheries, Bureau of Sport Fisheries and Wildlife, Bureau of Mines, Bureau of Land Management, National Park Service, Bureau of Outdoor Recreation, and Office of Saline Water. The Department's responsibilities include management, conservation, and development of marine natural resources; measurement and enforcement of water quality standards; acquisition, preservation, and development of coastal areas; and identification of sources and inter-relationships for supply of fresh water. These missions require timely and repetitive observations of many coastal areas of the Nation, its Territories, and Antarctica.

1. Near-Shore Land-Use (and shoreline changes): As the result of increasing population and commercial expansion along our coasts, land-use in the near-shore areas is changing rapidly, and maps of land-use cannot be kept current with existing survey techniques. These maps provide the basis for administering a number of Federal programs in the coastal areas, and when they can be made available, they are of considerable assistance to State, regional, and local planning authorities as well. Small-scale photography would provide data to produce regional maps and would permit identification of areas deserving more detailed study. Large-scale data would permit detailed study of selected areas and provide base information for routine updating of topographic maps. Infrared scanner data would assist in delineating areas of land-fill and identification of geologic hazards.

25X1D

Product type: (a)  (b) black and white; (c)

Scale<sup>1</sup>/Resolution: (a) 1:250,000; 100 to 200 feet; (b) 1:100,000 and larger;  (c) 1:100,000 and larger;

25X1D

System: (a) KH-4 B frame  SR-71 modified.

25X1D

Geographic Area: (a) The coastline, extending 100 miles inland, of the entire United States and its Territories; (b) the coastline, extending 25 miles inland, of the entire United States and its Territories supplemented locally by coverage dictated by interpretation of (a) and by

<sup>1</sup>Scale refers to scale of end products in this section.



catastrophic events, such as major storms; (c) the coastal regions of the entire United States and its Territories.

Frequency: (a) Monthly, with less frequent coverage also useful; (b) 10-year cycle supplemented by local coverage in the case of catastrophic events, such as major storms; (c) once for the entire coastline of the United States and its Territories, and annually for the conterminous United States and selected parts of Alaska, Hawaii, and the Territories.

Priority: (a) High; (b) medium; (c) low.

2. Current Patterns: Current patterns in the near-shore areas are not well understood and are being significantly affected by man-made alterations, such as engineering structures, as well as by natural processes. Currents influence a variety of commercial, recreational, and other activities in coastal areas. Repetitive synoptic coverage utilizing "natural" (principally suspended sediment) and thermal markers can provide two-dimensional knowledge of current dynamics essential to analysis of pollution problems.

25X1D

Product type: (a) Color  black and white

25X1D

Scale/Resolution: (a) 1:250,000; 100 to 200 feet; (b) 1:100,000 and larger;

25X1D

System: (a) KH-4 panoramic; (b) SR-71.

Geographic Area: (a) The entire coastline of the United States and its territories and extending 50 miles to sea is of interest, but of principal concern are those areas being subjected to major alterations, including the principal estuarine areas; (b) same, but extending 20 miles to sea.

Frequency: (a) Ideally, sufficient coverage yearly to provide a composite of data at 30 minute intervals through an entire tidal cycle, although less frequent coverage would be useful; (b) same.

Priority: (a) High; (b) medium.

3. Sedimentation: Sediment is being deposited at increasing rates in near-shore and estuarine areas, thus affecting a broad range of water uses. Current survey methods do not permit adequate or timely surveys of sediment deposition which are needed for planning and management activities at the Federal, State, and local levels and for determining needed corrective actions. Photography can penetrate water and indicate areas

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of changing sedimentation which will aid in the delineation of sediment accumulations.

25X1D

Product type: Color, [ ] or black and white [ ]

Scale/Resolution: 1:100,000 and larger [ ]

25X1D

System: KH-4 panoramic

Geographic Area: The coastline of the conterminous United States and parts of Alaska, Hawaii, and its Territories extending ten miles inland and ten miles to sea.

Frequency: Annually, supplemented by local coverage following catastrophic events, such as major storms.

Priority: High for selected estuaries; medium for entire coast.

4. Distribution of Fishing Vessels: Foreign fishing fleets are increasingly concentrating efforts on fishing grounds of direct interest to U. S. economic and political interests. Current methods are inadequate for monitoring the movements of foreign fishing vessels which are having a major impact on the continued abundance of a variety of fishery stocks. Photographic data could supplement existing monitoring techniques and significantly improve the accuracy of estimates of the location of fishing vessels, changes in location with time, and the types of vessels. These observations might also lead to a better understanding of the migratory habits of some fish and of the impact of intensified fishing on certain stocks.

Product type: Black and white.

Scale/Resolution: 1:100,000 and larger [ ]

25X1D

System: KH-4 panoramic or SR-71.

Geographic Area: Primarily in the North Atlantic and North Pacific, as dictated by U. S. commercial and political interests, international agreements, and probable distribution of fish.

Frequency: At least weekly for routine surveillance; one-time or multiple observations in areas of particular interest.

Priority: High for selected fisheries.

5. Ice Properties and Distribution: Resource exploration and development

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are increasing in areas where water transport is seriously affected by ice conditions, particularly in the Arctic. Current survey methods are inadequate in polar areas and marginal elsewhere with respect to classifying ice, mapping its distribution, and predicting its behavior. Synoptic, repetitive observations of ice would aid greatly in determining the distribution of ice and improving understanding of ice dynamics. The uniform characteristics of such data would enhance the usefulness of the data for ice classification.

Product type: Black and white photographs, recording red and/or infrared energy.

Scale/Resolution: (a) 1:250,000; 100 to 200 feet; (b) 1:100,000 and larger;

System: (a) KH-4 B frame; (b) KH-4 panoramic.

Geographic Area: Arctic and Antarctic ocean areas, Great Lakes, Alaskan coastal areas.

Frequency: Weekly or twice weekly in melt and freeze seasons for smaller scale; monthly or twice monthly in melt and freeze seasons for larger scale.

Priority: High for the Arctic; medium for Great Lakes; low for Antarctica.

## V. DEPARTMENT OF TRANSPORTATION APPLICATIONS

The Department of Transportation, including the Coast Guard, has statutory responsibilities related to marine commerce. Missions include marine safety and protection of life and property in port and at sea, delineation and prediction of ice masses, oceanographic and meteorological observations, provision of navigational services, transport system analysis and planning, and enforcement of U. S. marine laws and regulations. The accomplishment of these missions is complicated by the vast ocean areas of jurisdictional responsibility and the remoteness and inaccessibility of Arctic and sub-Arctic areas.

1. Sea Ice Reconnaissance: Expansion of U. S. commercial activities in the Arctic, including ocean transport, port development, and off-shore oil drilling, is inhibited by lack of data on the formation, dynamics, and deformation of sea ice in the Arctic. The possibility of expanding Arctic marine activities through the extension of seasonal operations and the possible use of new transport routes such as the northwest passage cannot be adequately evaluated without access to large-area, sea ice data.

Arctic sea ice photographic observations for use in research and long-term planning and operational ice forecasting and ship routing could contribute to greater effectiveness of icebreaker operations to support transportation, and commerce. Arctic ice reconnaissance specifically can enhance effectiveness by improving the definition and evaluation of sea ice boundaries; fast ice boundaries; relative ice ridge size and frequency; polynas,<sup>1</sup> cracks, and leads; and ice movement and floe deformation indicating pressure areas.

Product type: Color or black and white photographs [redacted]

[redacted] could provide supplementary data.

Scale/Resolution:<sup>2</sup> [redacted]

System: [redacted] KH-4 panoramic; SR-71.

Geographic Area: Northern Bering Sea, through the Bering Strait, along the Alaskan Arctic coast [redacted]

[redacted] Special immediate concern focuses on the Alaskan Coast from Point

<sup>1</sup>Ice openings.

<sup>2</sup>Resolution refers to resolution of photographs in this section.

25X6

[REDACTED] Coastal areas should be covered from the shore-line to 100 miles depth into the pack ice. Channels should be covered in their entirety.

Frequency: Coverage should be year-round as permitted by Arctic winter darkness, with a frequency of once per month to obtain planning and research data; more frequent coverage is required to provide operational routing forecasts.

Priority: High.

2. Iceberg Reconnaissance: The operational deployment of ships and aircraft of the International Ice Patrol is at times inefficient because broad-scale reconnaissance data for the entire ice patrol area on which to base the deployment is lacking. Also, the planning of each season's operations suffers from lack of data on the generation of icebergs and their distribution throughout the area. Reconnaissance of major icebergs-producing glaciers in West Greenland would determine the approximate number of icebergs calved and establish the advance or recession of glacier termini. Reconnaissance of icebergs activity areas would establish initial locations for tracking by conventional forces as the icebergs approach the shipping lanes.

Product type: Color or black and white photographs.

25X1D

Scale/Resolution: [REDACTED]

System: KH-4 panoramic.

Geographic Area: Along the West Greenland coast from 69°N to 80°N Latitude and from Davis Strait to the Grand Banks.

Frequency: Glacier termini should be recorded about March and October each year; ocean areas should be recorded as weather permits during April, May, and June.

Priority: High.

3. Fisheries Law Enforcement: Limited conventional air and surface forces are unable to maintain adequate surveillance over the territorial sea, contiguous fisheries zone, and treaty areas for U. S. law enforcement. Broad-scale surveillance of foreign fishery activities near U. S. shores and in treaty areas would contribute to the improved deployment of Coast Guard forces and detection of violations and thus to U. S. law enforcement in these areas.

Product type: Black and white photographs.

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Scale/Resolution: 40 feet.

System: KH-4 panoramic.

Geographic Area: Northwest Atlantic and Northeast Pacific fishing areas, including the Aleutian chain.


Frequency: Monthly during fishing season.

Priority: High.

4. Ocean Surveillance: Surveillance of the ocean with conventional forces is not full adequate for support of many Coast Guard missions. Satellite surveillance of specific ocean areas would provide advance knowledge of oceanographic phenomena to aid in research cruise planning. Satellite photographs would also be useful in monitoring the location of networks of large diameter ocean data buoys to detect changes that might occur. Reconnaissance photographs of selected areas could also lead to greater understanding of the dynamics of ocean currents and thus improve drift calculations to aid search and rescue forces. In the exceptional case of a major marine disaster prompt availability of photographs would contribute to the effectiveness of search operations, particularly in remote ocean areas.

Product type: Black and white photographs.

25X1D

Scale/Resolution: 

System: KH-4 panoramic

Geographic Area: Selected ocean areas for current studies and buoy location; any ocean area in event of major disaster.

Frequency: Bi-monthly for oceanographic research and buoy monitoring; one time for disaster.

Priority: High.

5. Domestic Icebreaking: Aerial reconnaissance of ice conditions in the Great Lakes is frequently inadequate to optimize the deployment of Coast Guard icebreakers to facilitate the winter movement of ships in that area. Lack of ice observations over the Great Lakes has at time resulted in inefficiencies in maritime shipping and economic loss both to the maritime industry and major industrial cities in the region. Reconnaissance observations of Great Lakes ice conditions would aid in research studies and planning the deployment of icebreakers, more accurate ice forecasting, and improved ship routing, leading to greater economy in

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sustained operations, enhanced safety, and a prolonged shipping season.

Product type: Black and white photographs.

Scale/Resolution: [REDACTED]

25X1D

System: (a) KH-4 panoramic; [REDACTED] (a) and (b) SR-71.

25X1D

Geographic Area: Great Lakes and the St. Lawrence Seaway.

Frequency: Monthly during ice season for ice research and planning; weekly from January 1 to April 15 for operational forecasting and ship routing.

Priority: High.

6. Pollution Detection and Monitoring: No means currently exist for systematic surveillance to detect marine pollution or to monitor the movement of pollutants resulting from deliberate or accidental discharges from ships or coastal facilities. Photographic and infrared reconnaissance data over broad coastal areas would contribute to the identification of the source and extent of thermal and oil pollution in ports and harbors, estuaries, and offshore and thus to improved enforcement of U. S. anti-pollution laws and international treaty obligations. Also, monitoring of major oil spills could contribute to better techniques for containing spills through improved understanding of the effect of fresh water discharges, sea state, currents, winds, and kelp beds on pollution dispersal.

Product type: Black and white photographs [REDACTED]

25X1D

Scale/Resolution: [REDACTED]

System: [REDACTED] SR-71.

25X1D

25X1A

Geographic Area: U. S. coastal areas, including the Great Lakes; selected sites of known or suspected pollution incidents.

Frequency: Weekly in ice-free areas for routine coverage; one-time or multiple coverage of pollution incidents.

Priority: High for known or suspected incidents; low for routine coverage of entire coast.

7. Ports and Harbors: The Department of Transportation has a similar requirement to that of the Department of Commerce under this heading.

VI. DEPARTMENT OF AGRICULTURE APPLICATIONS

The Department of Agriculture, including the Soil Conservation Service and the Forest Service, administers conservation programs covering hundreds of thousands of acres of coastal lands--privately owned cropland, grassland, woodland, and the National Forests. The quality of our coastal waters, bays, and estuaries is directly influenced by the use and management of the land and water resources in the drainage basins. Also, the volume of sediment being discharged into estuaries of the streams and rivers and the level of pollution resulting from agricultural activities have a significant influence on the marine environment.

1. Land Management:<sup>1</sup> Up-to-date data are needed in the planning and implementation of programs for land and water conservation and management having direct influence on the marine environment. Of particular importance are programs for the land and water management of coastal agricultural and forest lands. Data are needed relating to water depths, vegetation, fresh and saline waters, sediment sources, concentration of pollutants, and general coastal land use and management problems.

Product type: Color

25X1D

Scale/Resolution: 1:100,000;<sup>2</sup> 50 feet.

System: KH-4 panoramic; SR-71.

Geographic Area: U. S. coastal and estuarine areas.

Frequency: 3 to 5 year frequency, with seasonal variation.

Priority: High.

<sup>1</sup>Requirement extends to entire watershed areas, with emphasis in this description given to coastal and estuarine features.

<sup>2</sup>Scale refers to scale of end product in this section.



## VII. PROCEDURES AND SUPPORTING ACTIVITIES

The procedures for requesting missions to obtain [ ] material and for processing and distributing the material will vary considerably, depending on the specific requirement. Applications generally fall into three categories: planning, research, and operations. These may be further categorized according to the perishability of the material, repetitiveness of coverage needed, and flexibility in the timing and geographical location of the coverage.

25X1A

Usually requests for material could be made on a one-time basis, submitted periodically or on a less systematic recurring basis, or presented as standing requests for coverage on an opportunistic basis. Usually, a request for research material of a routine nature could progress at a leisurely pace--perhaps during a period of months--and the material acquired when convenient. Also, the material could be processed and distributed to the user agency without a sense of urgency. Similarly, the need for planning data can often be anticipated well in advance and normal processing of requests and results would be acceptable. However, there are certain types of research data and planning data, as well as operational data, that are needed on very short notice, perhaps even a few hours, such as coverage of a natural catastrophe. In some instances the acquired data would have to be processed and distributed very quickly to be useful, such as ice reconnaissance which would be used in improving forecasts of ice conditions.

To enable civilian agencies to be prepared to use [ ] material promptly and efficiently, it is essential that the agency requesting material be informed as soon as a decision is made to satisfy the request. This leadtime will enable the agency to adjust its work schedules to handle the material which, at least initially, will probably be received at irregular intervals.

25X1A

The [ ] serves as the focal point for new requests for specific coverage by reconnaissance satellite and aircraft systems. The Steering Committee in some instances might wish to establish direct channels for requests between the user agencies and the intelligence community such as the existing channel for the Geological Survey's requests for topographic coverage and the developing Navy-Coast Guard program for coverage of Arctic ice areas. In any event, all arrangements both of a short-term and long-term character, as well as experiments to demonstrate the value of [ ] material, should be coordinated through the Steering Committee. This also includes short-notice one-time requests, such as coverage of a pollution catastrophe, which would be handled by the Steering Committee Chairman as emergencies arise.

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The Geological Survey facility at Reston has provided space to accommodate a limited number of specialists from other agencies, including the Departments of Commerce, Transportation, and Agriculture, as well as marine specialists of the Department of the Interior, to analyze [ ] material requested by the agencies. Personnel would be provided by the requesting agency within existing program budgets. In addition, the Coast Guard will have a small work space in its new facility this fall and can also call on the Naval Oceanographic Office for limited working areas and for limited assistance in processing [ ] materials. If any agency program to use [ ] materials grows at a rapid rate, however, there will quickly be additional facility and financial requirements that could not be resolved without new sources of funding.

25X1A

[ ] material for several of the high priority requirements could be handled by present staff in the concerned agencies. However, even a very small effort should be accompanied by clearance of a few additional key specialists. A significant increase in use of [ ] material will require a corresponding increase in the number of cleared personnel--both at the working level and at the administrative and policy levels. The additional cleared personnel requirement for a modest program to use [ ] material for marine science purposes would probably be at least 20 per Department.

25X1A  
25X1A

## VIII. MODIFICATIONS OF SYSTEMS AND PROCEDURES

25X1A Many of the requirements that have been identified envisage handling of [ ] material only by Government and contractor personnel which should ease security problems. In some instances, public release in the forms of appropriately sanitized medium scale maps and charts is anticipated. The release to the public of specific announcements, scientific reports, and forecasts after appropriate review with respect to conformance with security procedures would also be most useful. Of particular value in 25X1A facilitating use of [ ] material and products are the sanitization procedures, which in turn are related to available conventional means for insuring a plausible cover. Since many of the applications relate to the conterminous United States, possible aircraft programs can often serve as such a cover. Also the development of the Earth Resources Satellite program might assist in this regard. It would be helpful if steps were taken to increase participation of civilian agencies which are not members of the U. S. Intelligence Board in reviewing relevant sanitization measures when the agencies plan to use large quantities of [ ] material.

Providing that an adequate number of Government personnel using conventional means of analysis are cleared to use [ ] material for guidance, many of the requirements for internal Government use will require no sanitization other than that needed to explain the apparent wisdom of planners and scientists to interested colleagues. However, even within Government 25X1A agencies, relaxation of restrictions could increase the utility of [ ] products. For example, the requirement for special handling of imagery in all regions of the spectrum inhibits analysis of data. In many instances, and particularly with regard to imagery outside the visible region of the spectrum, determination of system characteristics with reference to imagery alone is virtually impossible, and downgrading of such imagery would be extremely useful to the extent that this is possible. 25X1A

In a few cases, such as planning for development of coastal areas, which involves several levels of government, the value of [ ] material would be significantly enhanced if [ ] products could be broadly disseminated on an unclassified basis. Specifically, release of thematic maps at scales larger than 1:250,000 would be extremely useful to non-Federal planners as well as Government personnel, particularly those in the field. Also, should the eventual release of selected types of photography become possible, planning activities would greatly benefit. 25X1A 25X1A

25X1A The utility of some types of [ ] material would be considerably enhanced, particularly with respect to oceanography, by the increased use of color and infrared false color, together with compatible optical systems. The use of a range of filters would also increase the opportunities for material useful to civilian agencies, and the addition of a still broader

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multi-spectral capability would yield more information of value to the oceanographer.

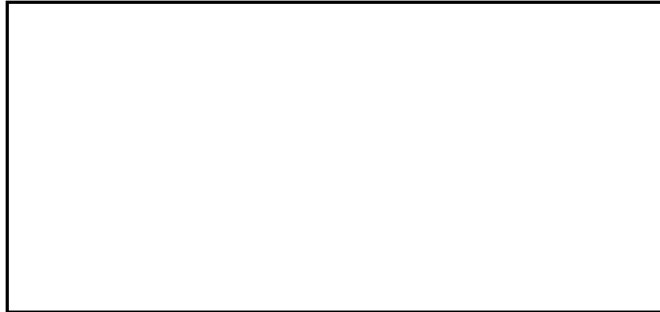
Many of the requirements can be best satisfied through repetitive coverage of the same or related areas or activities. Thus, any increase in frequency of coverage would be welcomed. This is particularly important with regard to Arctic ice conditions.

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APPENDICES

25X1A



## MARINE SCIENCES ANNEX

Appendix A consisting of pages numbered 41, 42, and 43 have been detached from this report and are filed separately.

APPENDIX BSECURITY AND HANDLING PROCEDURES FOR  
SATELLITE MATERIALS

The security procedures for control of materials controlled from our satellite reconnaissance activities are outlined in the TALENT Control Manual published by the Director of Central Intelligence (DCI), and the TALENT Control Manual published by the Department of Defense. These contain specific rules and describe methods for receiving, controlling, and transmitting materials and the products derived therefrom. The DOD TALENT Control Manual is somewhat more detailed than the DCI manual. In addition to these manuals, the U. S. Intelligence Board (USIB) has approved a set of basic rules by which both materials and intelligence derived from satellite systems may be sanitized for use outside of highly restrictive TALENT KEYHOLE channels. This is the "Manual for Sanitization, Decontrol and Downgrading," TCS-0131/65.

Briefly, the Senior Intelligence Officer of each agency using these special materials is responsible for the implementation of prescribed policies and procedures. In each instance, an officer is assigned as a TALENT Control Officer (TCO) who is charged with insuring that proper security control, handling and distribution security standards are met. Any sanitization or downgrading is accomplished in accordance with the prescribed rules and is designed to conceal fully the qualitative and quantitative capabilities of satellite reconnaissance systems. The TCO is responsible for final security release of materials sanitized.

The several annexes to the Sanitization Manual pertain to uses of satellite photography and its applicability to various programs.

There have been very stringent restrictions placed on the use of photography itself and only in specifically approved instances has the USIB permitted release outside the TALENT KEYHOLE system. When this has been permitted, the photography has been changed in format and appearance insofar as possible to preclude determination of satellite photographic capabilities. Where possible, format and titling is provided which would make it appear as from conventional aerial photographic systems.

In the case of map and chart production from satellite photography, there is in general more latitude and less restriction in the classification and control of the products.

This is particularly true of domestic maps and charts since ground truth data are immediately available as cover. The classification

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assigned charts of foreign areas when derived from TALENT KEYHOLE photography is SECRET if the scale is 1:10,000 to 1:49,000; CONFIDENTIAL if the scale is 1:50,000 to 1:249,000; and unclassified if the scale is smaller than 1:249,000. The portrayal of sensitive installations such as nuclear missile storage sites, etc., obviously require security classification and would override the scale factors. Material produced at scales larger than 1:10,000 of foreign areas may be approved only through USIB/COMIREX action. Maps and charts of Antarctica at scales larger than 1:3,000,000 will be classified at least CONFIDENTIAL.

When adequate and plausible cover is available and can be properly documented, the security classification of the derived products and data can be reduced or eliminated. TALENT KEYHOLE photography, however, cannot be used in photo-based products such as the PICTOMAP or ORTHOPICTOMAP in unclassified form to preclude determination by a recipient that this is satellite photography from which a determination of system capability and resolution could be made.

Requests by non-USIB agencies for TALENT KEYHOLE materials to meet the requirements of potential users are directed to the Office of Science and Technology, Executive Office of the President, where tasking to meet the requirement is initiated after review and evaluation by the ☐ Steering Group.

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HANDLE VIA TALENT KEYHOLE CONTROL SYSTEM ONLY

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